ATTACHMENT B

Attachment B: Reference Circuits – Stations Operated in the Amateur Radio Service In Selected Bands

High End 75 M SSB contest station

Competitive contest stations use big antennas in an effort to contact even the smallest and most remote stations.

Characteristics	Values	
Frequency Band (MHz)	3.75-4.0	
Channel Spacing	Random	
Information Rate	speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	12	
Maximum e.i.r.p. (dBW)	43.5	
Receiver IF Bandwidth	2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-135	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

3-element yagi--K3ZO and others. Vertical polarization is sometimes preferred for distant contacts, trading off a lower ERP for a more suitable radiation pattern.

Typical 75M SSB contest station

Characteristics	Values	
Frequency Band (MHz)	3.75-4.0	
Channel Spacing	Random	
Information Rate	speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	8	
Maximum e.i.r.p. (dBW)	39.5	
Receiver IF Bandwidth	2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-135	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Full wave horizontal loop at 50 ft.

High End 80M CW contest station

Characteristics	Values	
Frequency Band (MHz)	3.5-3.75	
Channel Spacing	Random	
Information Rate	10 bit/sec	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	12	
Maximum e.i.r.p. (dBW)	43.5	
Receiver IF Bandwidth	CW:100 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-149	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Typical 75 M SSB Amateur Station

The typical SSB amateur station communicates with other SSB using F layer propagation.

Characteristics	Values	
Frequency Band (MHz)	3.75-4.0	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	7	
Maximum e.i.r.p. (dBW)	38.5	
Receiver IF Bandwidth	SSB:2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-135	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Dipole at 40 ft

Typical 80M CW Amateur Station

Characteristics	Values	
Frequency Band (MHz)	3.5-3.75	
Channel Spacing	Random	
Information Rate	10 bit/s	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	20	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	7	
Maximum e.i.r.p. (dBW)	26.8	
Receiver IF Bandwidth	CW:100Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-149	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	Depends on propgation mode	

Dipole at 40 ft

High End 80 M Digital Amateur Station

Characteristics	Values	
Frequency Band (MHz)	3.5-3.75	
Channel Spacing	Random	
Information Rate	45-300 bit/sec	
Emission Type(s)	Many different types	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: .2
Antenna Polarization	Horizontal; Vertical	
Antenna Maximum Gain (dBi)	8	
Maximum e.i.r.p. (dBW)	39.5	
Receiver IF Bandwidth	500	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-142	
Receiver Signal-to-Noise Ratio (dB)	+3	
Maximum Path Length (km)	Depends on the propagation mode	

Typical 80M Digital Amateur Station

Characteristics	Values
Frequency Band (MHz)	3.5-3.75
Channel Spacing	Random
Information Rate	45-300 bit/sec, 0-300 bit/sec worst case
Emission Type(s)	Many different types
Transmitter Power (dBW)	17
Transmission Line Loss (dB)	Transmit: .2 Receive: .2
Antenna Polarization	Horizontal; Vertical
Antenna Maximum Gain (dBi)	7
Maximum e.i.r.p. (dBW)	23.8
Receiver IF Bandwidth	500 Hz
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-142
Receiver Signal-to-Noise Ratio (dB)	+3
Maximum Path Length (km)	Depends on propagation mode

Typical 80 M SSTV Amateur Station

The typical SSTV amateur station exchanges pictures with other stations.

Characteristics	Values
Frequency Band (MHz)	3.75-4.0
Channel Spacing	Random
Information Rate	.22 to 7.5 frames/sec
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	30
Transmission Line Loss (dB)	Transmit: .2 Receive: .2
Antenna Polarization	Horizontal; Vertical
Antenna Maximum Gain (dBi)	8
Maximum e.i.r.p. (dBW)	41.4
Receiver IF Bandwidth	2500
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-145
Receiver Signal-to-Noise Ratio (dB)	+30
Maximum Path Length (km)	Depends on propagation mode

Typical 80 M Beacon Amateur Station

N/A--There don't appear to be any in operation.

Typical 80 M Hand-Held Amateur Station

The typical SSB hand-held amateur station can communicate with some other SSB voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	3.75-4.0
Channel Spacing	Random
Information Rate	speech
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	3
Transmission Line Loss (dB)	Transmit: .0 Receive: 00
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	-20
Maximum e.i.r.p. (dBW)	-17
Receiver IF Bandwidth	2500 Hz
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-135
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	

Mizuho sell these little radios.

Typical 80M AM station

Characteristics	Values	
Frequency Band (MHz)	3.75-4.0	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	6K0A3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	8	
Maximum e.i.r.p. (dBW)	39.5	
Receiver IF Bandwidth	6 kHz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-132	
Receiver Signal-to-Noise Ratio (dB)	10	
Maximum Path Length (km)	Depends on propagation mode	

High End 20 M SSB contest station

Competitive contest stations use big antennas in an effort to contact even the smallest and most remote stations.

Characteristics	Values	
Frequency Band (MHz)	14.15-14.35	
Channel Spacing	Random	
Information Rate	speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .4	Receive: 0.4
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	17	
Maximum e.i.r.p. (dBW)	48.3	
Receiver IF Bandwidth	2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-149 (29000 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Stacked yagis in the Antenna book feed with 200 ft of Hardline in a quiet rural location.

Typical 20M SSB contest station

Characteristics	Values	
Frequency Band (MHz)	14.15-14.35	
Channel Spacing	Random	
Information Rate	speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .6	Receive: 0.6
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	14	
Maximum e.i.r.p. (dBW)	46.1	
Receiver IF Bandwidth	2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-145	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Single 4 element yagi in a typical suburban location. Height primarily affects the vertical pattern but not the maximum gain.

High End 20M CW contest station

Characteristics	Values	
Frequency Band (MHz)	14.0-14.100	
Channel Spacing	Random	
Information Rate	10 bit/sec	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .4	Receive: 0.4
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	17	
Maximum e.i.r.p. (dBW)	48.3	
Receiver IF Bandwidth	CW:100 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-149	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Typical 20 M SSB Amateur Station

The typical SSB amateur station communicates with other SSB using F layer propagation.

Characteristics	Values	
Frequency Band (MHz)	14.15-14.35	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .6	Receive: 0.6
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	12	
Maximum e.i.r.p. (dBW)	43.1	
Receiver IF Bandwidth	SSB:2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-145	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Legal limit amp and a small tribander like the Force 12 C3 (12' boom). Tribander has 4.5 dB gain over a dipole.

Typical 20M CW Amateur Station

Characteristics	Values	
Frequency Band (MHz)	14.0-14.1	
Channel Spacing	Random	
Information Rate	10 bit/s	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	20	
Transmission Line Loss (dB)	Transmit: .5	Receive: 0.5
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	8	
Maximum e.i.r.p. (dBW)	27.5	
Receiver IF Bandwidth	CW:100Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-159	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	Depends on propgation mode	

High End 20 M Digital Amateur Station

Characteristics	Values	
Frequency Band (MHz)	14.0-14.1	
Channel Spacing	Random	
Information Rate	45-300 bit/sec	
Emission Type(s)	Many different types	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .4	Receive: .4
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	17	
Maximum e.i.r.p. (dBW)	48.3	
Receiver IF Bandwidth	500	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-152	
Receiver Signal-to-Noise Ratio (dB)	+3	
Maximum Path Length (km)	Depends on the propagation mode	

Typical 20M Digital Amateur Station

Characteristics	Values
Frequency Band (MHz)	14.0-14.1
Channel Spacing	Random
Information Rate	45-300 bit/sec, 0-300 bit/sec worst case
Emission Type(s)	Many different types
Transmitter Power (dBW)	17
Transmission Line Loss (dB)	Transmit: .6 Receive: .6
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	8
Maximum e.i.r.p. (dBW)	24.4
Receiver IF Bandwidth	500 Hz
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-152
Receiver Signal-to-Noise Ratio (dB)	+3
Maximum Path Length (km)	Depends on propagation mode

Typical 20 M SSTV Amateur Station

The typical SSTV amateur station exchanges pictures with other stations.

Characteristics	Values
Frequency Band (MHz)	14.15-14.35
Channel Spacing	Random
Information Rate	.22 to 7.5 frames/sec
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	30
Transmission Line Loss (dB)	Transmit: .6 Receive: .6
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	12
Maximum e.i.r.p. (dBW)	41.4
Receiver IF Bandwidth	2500
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-145
Receiver Signal-to-Noise Ratio (dB)	+30
Maximum Path Length (km)	Depends on propagation mode

Typical 20 M Beacon Amateur Station

Characteristics	Values
Frequency Band (MHz)	14.1
Channel Spacing	N/A
Information Rate	10 bit/s
Emission Type(s)	50HA1A
Transmitter Power (dBW)	20
Transmission Line Loss (dB)	Transmit:.5
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	0
Maximum e.i.r.p. (dBW)	19.5
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	13
Receiver System Noise (dBW)	-159
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	depends on propagation mode

Typical 20 M Hand-Held Amateur Station

The typical SSB hand-held amateur station can communicate with other SSB voice amateur stations.

Characteristics	Values	
Frequency Band (MHz)	14.15-14.35	
Channel Spacing	Random	
Information Rate	speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	3	
Transmission Line Loss (dB)	Transmit: .0	Receive: 00
Antenna Polarization	Vertical	
Antenna Maximum Gain (dBi)	-10	
Maximum e.i.r.p. (dBW)	-7	
Receiver IF Bandwidth	2500 Hz	
Receiver Noise Figure (dB)	13	
Receiver System Noise (dBW)	-145	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)		

Mizuho sell these little radios.

Typical 20 M AM station

Characteristics	Values	
Frequency Band (MHz)	14.15-14.3	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	6K0A3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .5	Receive: 0.5
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	12	
Maximum e.i.r.p. (dBW)	43.2	
Receiver IF Bandwidth	6 kHz	
Receiver Noise Figure (dB)	7	
Receiver System Noise (dBW)	-142	
Receiver Signal-to-Noise Ratio (dB)	10	
Maximum Path Length (km)	Depends on propagation mode	

Typical 6 M EME Amateur Station

The typical EME model is capable of CW communication with other EME stations.

Characteristics	Values	
Frequency Band (MHz)	50-54	
Channel Spacing	Random	
Information Rate	CW: 10 bit/s	
Emission Type(s)	50H0A1A	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: .2	Receive: 0.2
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	19	
Maximum e.i.r.p. (dBW)	50.5	
Receiver IF Bandwidth	CW: 50 Hz	
Receiver Noise Figure (dB)	2	
Receiver System Noise (dBW)	-174 (5000 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	396,000 one way to moon at nominal apogee	

Four big yagis and 1500 watts..

High End 6M SSB Amateur Station

The high-end SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	50-52	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	31.7	
Transmission Line Loss (dB)	Transmit: 1	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	13.7	
Maximum e.i.r.p. (dBW)	44.4	
Receiver IF Bandwidth	SSB:2500 Hz CW:100 Hz	
Receiver Noise Figure (dB)	2	
Receiver System Noise (dBW)	-160 (2645 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Single 50 ft boom yagi and 1500 watt amp.

Typical 6M SSB Amateur Station

The typical SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	50-52	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	26	
Transmission Line Loss (dB)	Transmit: 1	Receive: 1
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	12	
Maximum e.i.r.p. (dBW)	37	
Receiver IF Bandwidth	SSB:2500 Hz CW:100Hz	
Receiver Noise Figure (dB)	2	
Receiver System Noise (dBW)	-160 (195 Kelvin background) -174 (CW)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

High-End 6M CW Amateur Station

The High-End CW amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	50-52
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	31.7
Transmission Line Loss (dB)	Transmit: 1 Receive: 1
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	13.7
Maximum e.i.r.p. (dBW)	44.4
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz
Receiver Noise Figure (dB)	.7
Receiver System Noise (dBW)	-174 (2645 Kelvin background) -160 (SSB)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	Depends on propgation mode

Typical 6 M CW Amateur Station

The typical CW amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	50-52
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	20
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	12
Maximum e.i.r.p. (dBW)	30
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz
Receiver Noise Figure (dB)	1
Receiver System Noise (dBW)	-174 (2645 Kelvin background) -160 for SSB
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	Depends on the propagation mode

Typical 6 M FM mobile Amateur Station

The typical FM-mobile amateur station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	51-54
Channel Spacing	5-kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	17
Transmission Line Loss (dB)	Transmit: 1 Receive: 1
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	1
Maximum e.i.r.p. (dBW)	17
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver System Noise (dBW)	-152 (2645 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 6 M FM-base Amateur Station

The typical FM voice station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	51-54
Channel Spacing	5 kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	20
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	3
Maximum e.i.r.p. (dBW)	21
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver System Noise (dBW)	-152 (2645 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 6 M Repeater Amateur Station

The typical FM repeater station extends the range of mobile stations

Characteristics	Values
Frequency Band (MHz)	51-54
Channel Spacing	20 kHz
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	18
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	5
Maximum e.i.r.p. (dBW)	21
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver System Noise (dBW)	-152 (2645 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 6 M Digital Amateur Station

Packet stations are typically used for point to point links on this band.

Characteristics	Values
Frequency Band (MHz)	50-54
Channel Spacing	20 kHz
Information Rate	1.2, 4.8,9.6, 56 kbit/s
Emission Type(s)	15K0F3D, 15K0G3D, 15K0G3D, 70K0G3D
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	10
Maximum e.i.r.p. (dBW)	18
Receiver IF Bandwidth	15 kHz, 15 kHz, 15 kHz, 70 kHz
Receiver Noise Figure (dB)	2 dB
Receiver System Noise (dBW)	-152, -152, -145 (2645 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	10
Maximum Path Length (km)	Depends on propagation mode

High End 6 M Beacon Amateur Station

Characteristics	Values
Frequency Band (MHz)	50-50.1
Channel Spacing	N/A
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	20
Transmission Line Loss (dB)	Transmit:1
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	3
Maximum e.i.r.p. (dBW)	22
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	1 dB
Receiver System Noise (dBW)	-174 (195 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+1

Typical 6 M Beacon Amateur Station

High gain omnidirectional antennas are often used to maximize the possibility of detecting band openings in different directions.

Characteristics	Values
Frequency Band (MHz)	50-50.1
Channel Spacing	N/A
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit:1
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	3
Maximum e.i.r.p. (dBW)	12
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	1 dB
Receiver System Noise (dBW)	-174 (2645 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	depends on propagation mode

Typical 6 M Hand-Held Amateur Station

The typical FM hand-held amateur station can communicate with other FM voice amateur stations and repeaters using line-of-sight and diffraction propagation modes.

Characteristics	Values
Frequency Band (MHz)	50-54
Channel Spacing	5 kHz
Information Rate	Speech
Emission Type(s)	15k0F3E or 15K0G3E
Transmitter Power (dBW)	7
Transmission Line Loss (dB)	Transmit:0
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	0
Maximum e.i.r.p. (dBW)	7
Receiver IF Bandwidth	15 kHz
Receiver Noise Figure (dB)	2 dB
Receiver System Noise (dBW)	-152 (2645 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+7 dB for 12 dB SINAD
Maximum Path Length (km)	depends on propagation mode

Typical 6 M Radio Control Amateur Station

The typical 6M radio control station is used for remotely directing model craft.

Characteristics	Values
Frequency Band (MHz)	50.8-51.0, 53.1-53.8
Channel Spacing	20 kHz, 100 kHz
Information Rate	typically < 500 bps
Emission Type(s)	15k0F8D or 15KA8D
Transmitter Power (dBW)	-3
Transmission Line Loss (dB)	Transmit:0
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	0
Maximum e.i.r.p. (dBW)	-3
Receiver IF Bandwidth	15 kHz
Receiver Noise Figure (dB)	2 dB
Receiver System Noise (dBW)	-152 (2645 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+3
Maximum Path Length (km)	line of sight

Typical High-End 23-cm EME Station

Big 23 cm EME Amateur Station on CW--KB2AH running 1.4 kW and a 10.3 meter dish.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random
Information Rate	CW: 10 bit/s
Emission Type(s)	50H0A1A
Transmitter Power (dBW)	31.5
Transmission Line Loss (dB)	Transmit: 1 Receive: 0
Antenna Polarization	Circular, RHCP Transmit, LHCP Receive
Antenna Maximum Gain (dBi)	40.3
Maximum e.i.r.p. (dBW)	71
Receiver IF Bandwidth	CW: 50 Hz
Receiver Noise Figure (dB)	0.3
Receiver Thermal Noise (dBW)	-197 (10 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	396,000 one way to moon at nominal apogee

Big 23 cm EME Amateur Station on SSB

The big EME stations on this band can operate SSB.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random
Information Rate	Speech
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	31.5
Transmission Line Loss (dB)	Transmit: 1 Receive: 0
Antenna Polarization	Circular, RHCP Transmit, LHCP Receive
Antenna Maximum Gain (dBi)	40.3
Maximum e.i.r.p. (dBW)	71
Receiver IF Bandwidth	SSB: 2500 Hz
Receiver Noise Figure (dB)	0.3
Receiver Thermal Noise (dBW)	-180 (10 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	396,000 one way to moon at nominal apogee

Typical 23 cm EME Amateur Station

The typical EME model is capable of CW communication with other EME stations.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random
Information Rate	CW: 10 bit/s
Emission Type(s)	50H0A1A
Transmitter Power (dBW)	23
Transmission Line Loss (dB)	Transmit: 1 Receive: 0
Antenna Polarization	Circular, RHCP Transmit, LHCP Receive
Antenna Maximum Gain (dBi)	32
Maximum e.i.r.p. (dBW)	54
Receiver IF Bandwidth	CW: 50 Hz
Receiver Noise Figure (dB)	0.4
Receiver Thermal Noise (dBW)	-195.8 (10 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	396,000 one way to moon at nominal apogee

High End 23 cm SSB Amateur Station

The high-end SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	1240-1300	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	23	
Transmission Line Loss (dB)	Transmit: 2	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	23	
Maximum e.i.r.p. (dBW)	44	
Receiver IF Bandwidth	SSB:2500 Hz CW:100 Hz	
Receiver Noise Figure (dB)	0.4	
Receiver Thermal Noise (dBW)	-172 (155 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Typical 23 cm SSB Amateur Station

The typical SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	1240-1300	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	12	
Transmission Line Loss (dB)	Transmit: 0	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	20	
Maximum e.i.r.p. (dBW)	32	
Receiver IF Bandwidth	SSB:2500 Hz CW:100Hz	
Receiver Noise Figure (dB)	0.4	
Receiver Thermal Noise (dBW)	-172 (155 Kelvin background) -186 (CW)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Note: Mast mounted transverter setup to eliminate the need for expensive feedlines. Typically done with DEM and Parabolic AB equipment.

High-End 23 cm CW Amateur Station

The High-End CW amateur station communicates with other stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	1240-1300	
Channel Spacing	Random	
Information Rate	10 bit/s	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	23	
Transmission Line Loss (dB)	Transmit: 2	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	23	
Maximum e.i.r.p. (dBW)	44	
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz	
Receiver Noise Figure (dB)	1	
Receiver Thermal Noise (dBW)	*-185 (155 Kelvin background) -171 (SSB)*	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	Depends on propgation mode	

Typical 23 cm CW Amateur Station

The typical CW amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz
Receiver Noise Figure (dB)	1
Receiver Thermal Noise (dBW)	-182 (155 Kelvin background) -168 for SSB
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	Depends on the propagation mode

Note: CW is often necessary on transmit to extend the range at this power level.

Typical 23 cm SSB Satellite Uplink Amateur Station

Due to international regulations, this band can only be used for uplinks to satellites; no satellites have downlinks on this band.

Characteristics	Values
Frequency Band (MHz)	1260-1270
Channel Spacing	Random
Information Rate	Speech
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	15
Transmission Line Loss (dB)	Transmit: 2
Antenna Polarization	RHCP, Horizontal, or Vertical
Antenna Maximum Gain (dBi)	23
Maximum e.i.r.p. (dBW)	36
Receiver IF Bandwidth	N/A
Receiver Noise Figure (dB)	N/A
Receiver Thermal Noise (dBW)	N/A
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	45,000km

Note: Mode L on Oscar 13 did not work as well as predicted--less power may be required with future satellites.

Typical 23 cm CW Satellite Uplink Amateur Station

Due to international regulations this band can only be used for satellite uplinks; no satellites have downlinks on this band.

Characteristics	Values
Frequency Band (MHz)	1260-1270
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2
Antenna Polarization	RHCP, Horizontal, or Vertical
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	N/A
Receiver Noise Figure (dB)	N/A
Receiver Thermal Noise (dBW)	N/A
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	45,000km

Note: Mode L on Oscar 13 did not work as well as predicted--less power may be required with future satellites.

Typical 23 cm FM mobile Amateur Station

The typical FM-mobile amateur station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random, usually in 10-kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 1 Receive: 1
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	8
Maximum e.i.r.p. (dBW)	17
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-160 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 23 cm FM-base Amateur Station

The typical FM voice station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	Random, usually in 10-kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-159 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINDAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 23 cm Repeater Amateur Station

The typical FM repeater station extends the range of mobile stations

Characteristics	Values
Frequency Band (MHz)	1270-1276, 1282-1288
Channel Spacing	25 kHz in California
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-159 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINDAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 23 cm AM ATV Amateur Station

The typical AM ATV station communicates with other ATV stations and repeaters using LOS modes.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	6 MHz
Information Rate	Fast scan video
Emission Type(s)	visual 5M25C3F Aural 36K0F3E
Transmitter Power (dBW)	12
Transmission Line Loss (dB)	Transmit: 2 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	30
Receiver IF Bandwidth	4.2 MHz
Receiver Noise Figure (dB)	1 (mast mounted preamp)
Receiver Thermal Noise (dBW)	-139 (155 kelvin background)
Receiver Signal-to-Noise Ratio (dB)	35 dB (4 dB for marginal contacts)
Maximum Path Length (km)	line of sight

Typical 23 cm Packet Amateur Station

Packet stations are typically used for point to point links on this band.

Characteristics	Values
Frequency Band (MHz)	1240-1300
Channel Spacing	25kHz, 100 kHz
Information Rate	1.2, 9.6, 56 kit/s
Emission Type(s)	15K0F3E, 15K0G3E, 70K0G3E
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	15 kHz, 70 kHz
Receiver Noise Figure (dB)	2 dB
Receiver Thermal Noise (dBW)	-162, -162, -155
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	line of sight

High End 23 cm Beacon Amateur Station

KH6HME--uses a high gain antenna to detect propagation over the tropo duct between Hawaii and North America.

Characteristics	Values
Frequency Band (MHz)	1296.000
Channel Spacing	N/A
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	12
Transmission Line Loss (dB)	Transmit:1
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	23
Maximum e.i.r.p. (dBW)	34
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	1 dB
Receiver Thermal Noise (dBW)	-185 (155 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	over 4100 km

Typical 23 cm Beacon Amateur Station

High gain omnidirectional antennas are often used to maximize the possibility of detecting band openings in different directions.

Characteristics	Values
Frequency Band (MHz)	1296.-1297
Channel Spacing	N/A
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit:1
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	9
Maximum e.i.r.p. (dBW)	18
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	1 dB
Receiver Thermal Noise (dBW)	-185 (155 Kelvin background temperature)
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	depends on propagation mode

Big 13 cm EME Amateur Station on CW--W4HHK

Characteristics	Values	
Frequency Band (MHz)	2300-2310, 2390-2450	
Channel Spacing	Random	
Information Rate	CW: 10 bit/s	
Emission Type(s)	50H0A1A	
Transmitter Power (dBW)	26	
Transmission Line Loss (dB)	Transmit: 3	Receive: 0
Antenna Polarization	Linear; rotatable	
Antenna Maximum Gain (dBi)	44	
Maximum e.i.r.p. (dBW)	67	
Receiver IF Bandwidth	CW: 50 Hz	
Receiver Noise Figure (dB)	0.5	
Receiver Thermal Noise (dBW)	-194 (20 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	396,000 one way to moon at nominal apogee	

Note: The VA802 Klystron used by W4HHK is capable of 1 kW of output power, but are typically run at 300 to 400 watts output. The noise from the moon doubles the background temperature.

Big 13 cm EME Amateur Station on SSB

The big EME stations on this band can operate SSB.

Characteristics	Values	
Frequency Band (MHz)	2300-2310, 2390-2450	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	26	
Transmission Line Loss (dB)	Transmit: 3	Receive: 0
Antenna Polarization	Linear; rotatable	
Antenna Maximum Gain (dBi)	44	
Maximum e.i.r.p. (dBW)	67	
Receiver IF Bandwidth	SSB: 2500 Hz	
Receiver Noise Figure (dB)	0.5	
Receiver Thermal Noise (dBW)	-177 (20 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	396,000 one way to moon at nominal apogee	

Typical 13 cm EME Amateur Station

The typical EME model is capable of CW communication with other EME stations.

Characteristics	Values	
Frequency Band (MHz)	2300-2310, 2390-2450	
Channel Spacing	Random	
Information Rate	CW: 10 bit/s	
Emission Type(s)	50H0A1A	
Transmitter Power (dBW)	20	
Transmission Line Loss (dB)	Transmit: 2	Receive: 0
Antenna Polarization	Linear; rotatable	
Antenna Maximum Gain (dBi)	37	
Maximum e.i.r.p. (dBW)	55	
Receiver IF Bandwidth	CW: 50 Hz	
Receiver Noise Figure (dB)	0.5	
Receiver Thermal Noise (dBW)	-195 (10 Kelvin background)	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	396,000 one way to moon at nominal apogee	

High End 13 cm SSB Amateur Station

The high-end SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	2300-2310	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	26	
Transmission Line Loss (dB)	Transmit: 3	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	26	
Maximum e.i.r.p. (dBW)	50	
Receiver IF Bandwidth	SSB:2500 Hz CW:100 Hz	
Receiver Noise Figure (dB)	0.5	
Receiver Thermal Noise (dBW)	-172 (155 Kelvin background) -186 (CW)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

Typically 200 watts and a dish with his VA-802 Klystron factoring in feed line loss.

Typical 13 cm SSB Amateur Station

The typical SSB amateur station communicates with other SSB/CW stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	2300-2310	
Channel Spacing	Random	
Information Rate	Speech	
Emission Type(s)	2K50J3E	
Transmitter Power (dBW)	10	
Transmission Line Loss (dB)	Transmit: 3	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	23	
Maximum e.i.r.p. (dBW)	30	
Receiver IF Bandwidth	SSB:2500 Hz CW:100Hz	
Receiver Noise Figure (dB)	0.5	
Receiver Thermal Noise (dBW)	-172 (155 Kelvin background) -186 (CW)	
Receiver Signal-to-Noise Ratio (dB)	+6	
Maximum Path Length (km)	Depends on propagation mode	

High-End 13 cm CW Amateur Station

The High-End CW amateur station communicates with other stations using troposcatter.

Characteristics	Values	
Frequency Band (MHz)	2300-2310	
Channel Spacing	Random	
Information Rate	10 bit/s	
Emission Type(s)	100HA1A	
Transmitter Power (dBW)	23	
Transmission Line Loss (dB)	Transmit: 2	Receive: 0
Antenna Polarization	Horizontal	
Antenna Maximum Gain (dBi)	26	
Maximum e.i.r.p. (dBW)	50	
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz	
Receiver Noise Figure (dB)	1	
Receiver Thermal Noise (dBW)	-186 (155 Kelvin background) -172 (SSB)	
Receiver Signal-to-Noise Ratio (dB)	+1	
Maximum Path Length (km)	*Depends on propgation mode*	

Typical 13cm CW Amateur Station

The typical CW amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	2300-2310
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	3
Transmission Line Loss (dB)	Transmit: 3 Receive: 3
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	20
Receiver IF Bandwidth	CW:100Hz SSB:2500 Hz
Receiver Noise Figure (dB)	1
Receiver Thermal Noise (dBW)	-181 (155 Kelvin background) -167 for SSB
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	Depends on the propagation mode

Note: CW is often necessary on transmit to extend the range at this power level.

Typical 13 cm SSB Satellite Amateur Station

Characteristics	Values
Frequency Band (MHz)	2400-2450
Channel Spacing	Random
Information Rate	Speech
Emission Type(s)	2K50J3E
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	RHCP
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	30
Receiver IF Bandwidth	2500 Hz
Receiver Noise Figure (dB)	.4
Receiver Thermal Noise (dBW)	-178 (20 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	45,000km

Note: projections based on available hardware pending launch of the amateur Phase 3D satellite.

Typical 13 cm CW Satellite Amateur Station

Characteristics	Values
Frequency Band (MHz)	2400-2450
Channel Spacing	Random
Information Rate	10 bit/s
Emission Type(s)	100HA1A
Transmitter Power (dBW)	3
Transmission Line Loss (dB)	Transmit: 0 Receive:0
Antenna Polarization	RHCP, Horizontal, or Vertical
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	23
Receiver IF Bandwidth	100 Hz
Receiver Noise Figure (dB)	.4
Receiver Thermal Noise (dBW)	-192
Receiver Signal-to-Noise Ratio (dB)	+1
Maximum Path Length (km)	45,000km

Typical 13 cm FM mobile Amateur Station

The typical FM-mobile amateur station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	2400-2450, 2300-2310
Channel Spacing	Random, usually in 5-kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	3
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	8
Maximum e.i.r.p. (dBW)	9
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-159 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 13 cm FM-base Amateur Station

The typical FM voice station can communicate with other FM voice amateur stations.

Characteristics	Values
Frequency Band (MHz)	2400-2450, 2300-2310
Channel Spacing	Random, usually in 5-kHz steps
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	3
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	20
Maximum e.i.r.p. (dBW)	21
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-159 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINDAD)
Maximum Path Length (km)	Depends on propagation mode

Typical 13 cm Repeater Amateur Station

The typical FM repeater station extends the range of mobile stations

Characteristics	Values
Frequency Band (MHz)	2306-2309, 2410-2413
Channel Spacing	25 kHz in California
Information Rate	Speech
Emission Type(s)	15K0F3E or 15K0G3E
Transmitter Power (dBW)	8
Transmission Line Loss (dB)	Transmit: 2 Receive: 2
Antenna Polarization	Vertical
Antenna Maximum Gain (dBi)	12
Maximum e.i.r.p. (dBW)	28
Receiver IF Bandwidth	15kHz
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-159 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7 (for 12 dB SINDAD)
Maximum Path Length (km)	Depends on propagation mode